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ABSTRACT

This paper describes a professional development model which emerged from two projects that had professional development of teachers as an important component. The first project, Project Lighthouse, provided teachers with training to facilitate the inclusion of students with disabilities into general education classrooms. The second project was a science project designed to equip teachers with the knowledge and skills to help students succeed in the sciences as demonstrated by their academic performance both in their current grade and in subsequent grades. Teachers participated in the training and completed various forms of evaluation and feedback. Based on experiences with the two projects, researchers developed a professional development model that attempts to facilitate the growth of teachers toward sustained skill mastery using a focused, programmed approach that provides them with support at each stage. The model's six levels are as follows: basic information, observation, guided practice, skill enhancement, initial mastery, and sustained mastery. The paper describes how to accomplish each level of the model. (Contains 16 references.) (SM)

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The Effects of Professional Development Activities on the Skill Acquisition of Teachers

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Introduction

Throughout the last several decades a prolific amount of research, study, and experimentation has been conducted concerning teaching and learning. Now, as we prepare to enter the 21st Century a wealth of new and emerging information and knowledge promises to transform the educational landscape. Many exciting challenges and opportunities are appearing on the horizon. Much has been learned about what works and what doesn't work in education and what we should and should not be doing in our schools. There has been much discussion, debate, and disagreement regarding roles, responsibilities, approaches and effective practices. As we conclude the final year of this century we are beginning to sharpen our focus on the field of professional education with increasing clarity.

Yet, as we stand on the threshold of a new century the promises of tomorrow for our schools lie in our success in taking what we have learned in the decade that is ending and translating it into improved instructional opportunities for all children. Our success in this endeavor will depend on our ability to integrate within the classroom what we have learned from our journey through the maze of research and rhetoric of the preceding decade. As teacher educators it is virtually impossible to prepare teachers for everything they will encounter in their professional careers. Nor can we anticipate the many developments in teaching and learning that are certain to continue in the coming century. Thus, effective, efficient professional development on a consistent and continuing basis, firmly rooted in research, will hold the key to the future of education for our students.

The importance of successful professional development has long been acknowledged by professionals. Dimock (1973) noted that professional training is a major component in the development of an organization and in helping it to deal with change. Livneh (1988) observed that "to remain a competent professional, an individual must continually be involved in some type of learning." (p. 150) Palmer (1988) pointed out that leaving the university with a degree in hand is only the beginning for the new teacher because the knowledge and skills gained at the

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preservice level quickly become dated. The educator must continually acquire new knowledge and skills. Boshier (1985) says that this can help teachers to acquire characteristics that help satisfy or change the expectations of society in a number of ways; acculturation, citizenship, social change, and technical competence.

Effective professional development is essential to attract, retain, and improve the quality of professional educators. The process of personnel development is vitally linked to manpower planning and such a process includes:

1. Improving the performance of staff members in their present positions;
2. Developing key skills of selected personnel so as to fill anticipated vacancies;
3. Promoting the self development of all personnel in order to enhance their influence as individuals and facilitate need satisfaction.

Ashton, Buhr, and Crocker (1984) found a number of differences in the behavior of high and low efficacy teachers. High efficacy teachers maintained high academic standards, had clear expectations for students, concentrated on academic instruction, maintained on-task behavior, and combined a clear and supportive classroom environment with a strong academic orientation. In reviewing the existing literature, McDaniel and Divella-McCarthy (1989) suggested that professional development programs designed to stimulate, motivate, inspire and challenge can assist teachers in renewing their confidence in the potential of teaching and, thus, raise their teaching efficacy.

And, yet, developing professional development experiences that will truly lead to improved performance in the classroom is not an easy task. As WCER (1999) observed, it "is not a simple task of 'plan and implement.' Rather, it involves staying alert to the changing context in which one works, the stages of development teachers move through as they develop new knowledge and skills, and a host of other dynamics at work." (p. 1)

In their study of effective professional development for science and mathematics teachers, Loucks-Horsley, Hewson, Love, and Stiles (1998) discovered that successful professional development is a complex process that combines various elements and strategies at different times and that it is constantly evolving and changing.

Castetter (1976) noted six factors involved in an effective personnel development program:
Performance Requirements - Knowledge, skills, attitudes required for effective performance
Development Need - Improved performance for existing and anticipated roles
Performance Targets - Plans to close gaps between performance and expectations
Development Plans - Activities planned to close performance gaps
Unit Development Programs - Experiences designed link development plans to district wide instructional and support plans
Evaluation - Evaluation of results, redesign of programs

Loacker (1986) and Merriam (1988) outlined the following as principles of effective professional development.

- Participation is voluntary, even if external prompting occurs. Motivation must come from within.
- Respect among participants for each other's worth is evident.
- Adults must have a share in deciding what is to be learned. Facilitation must be collaborative. with leaders and learners engaged in a cooperative venture.
- A combination of action and reflection is essential.
- A spirit of critical reflection is cultivated.
- Nurturing of self-directed, empowered adults is the primary purpose.

Mundry and Loucks-Horsley (1999) examined four cases of professional development. These cases suggested that successful professional development for teachers can occur in schools that have a clearly articulated culture for change and available resources which should include knowledge, expertise, and time for teacher training. When attempting to implement curriculum, Mundry and Loucks-Horsley found that professional developers should assist teachers in selecting curriculum materials that fit in well with their context, rather than involving teachers in curriculum development.

Kennedy (WCER, 1999) examined the literature regarding the effectiveness of professional development programs for teachers of science and mathematics. She concluded that there were certain characteristics common to successful programs. The total contact time in these programs

was not the most important predictor of effects on student achievement. While there was some evidence of the advantage of distributed time, some studies showed the strongest influences on student learning with just a summer institute and no activities during the academic year. In-class visitations were not necessarily a key ingredient in effective professional development programs. Finally, Kennedy's review indicated that providing professional development to whole schools may not be the important feature of successful programs.

Kennedy also found that programs focusing on pedagogical strategies demonstrated smaller influences on student learning than programs that emphasized teachers' knowledge of the subject or on how students learn the subject. The more successful programs were not purely subject matter based, but focused on *how* students learn the subject matter. Loucks-Horsley, Hewson, Love, and Stiles noted that successful professional developers plan for the design to change over time to keep pace with changes in the environment and teachers' learning goals.

This paper describes a professional development model which emerged from several different projects which had professional development of teachers as an important component. The two projects are described first, then the model is presented and discussed.

Professional Development for Inclusion

The first project, Project Lighthouse, was designed to facilitate the inclusion of students with disabilities into general education classrooms. Inclusion is currently one of the most discussed and debated educational issues in the United States. Because most teachers have been prepared at the preservice level to teach in traditional, segregated settings, the success of inclusion depends on preparing teachers at the inservice level to teach in a different paradigm, a paradigm of inclusion, rather than exclusion. This requires different practices and strategies than those many teachers were taught in their preservice programs. A key ingredient in inclusion programs is high quality professional development for faculty and staff (NCERI 1995; McLaughlin and Warren, 1992, NASBE, 1993). Teachers, administrators and support staff cannot be expected to do what they have not been trained to do.

Unfortunately, many teachers, general and special, do not receive sufficient preparation at the preservice level in teaching in inclusive environments. Professional development was envisioned

in this project as a planned sequence of experiences designed to foster:

- continuing development of the skills, understanding and knowledge of each staff member, and
- cooperation, interaction and integrated activity among the disciplines represented in a program.

NASBE (1993) reported that teachers who are successful in inclusive environments caution against overemphasizing preplacement training (training before they are actually working with students with disabilities). Ironically, although many professional groups, state agencies and local districts have focused on preinclusion teacher training, teachers themselves report needing training and support once the students are actually in their classes, rather than before. Similarly, successful inclusion teachers again and again point to the fact that each child is different and so general training is of limited value. Conferencing on individual children before the school year is a must. However, teachers should not expect training of whatever kind to fully prepare them.

In general, teacher training for inclusion covers four areas: site visits; situation-specific problem solving sessions; training sessions that focus on instructional strategies and curricular adaptations for diverse learners; and inservice sessions on the change process itself.

Teachers reported that one essential step in planning for inclusion is observing other classrooms-both inclusive classrooms and the special classes in which soon-to-be included students were currently placed. Many teachers have no mental picture of what it would be like to work in an inclusive setting. Classroom observations and videotapes of inclusive classes are therefore key to providing a frame of reference for teachers. Districts should provide varying degrees of support for teachers who wish to observe inclusive classes. Many principals and district administrators should establish observation schedules for their participating teachers. But not all teachers have this opportunity.

Consistent with the literature on teacher development, teachers reported that rather than "front loading" teacher training programs about inclusion, it is more important, after initial training and site visits, to determine their training needs based on their day-to-day experiences once they have actually started their own inclusive classroom. Inservice training then becomes structured

problem-solving sessions where teachers work together to identify needed resources and strategies to meet the needs of students in their class.

In addition, principals in inclusive schools report restructuring their faculty meetings so that the bulk of the time is spent addressing teacher concerns about individual students and classroom strategies. Other principals have restructured the school's day-today schedule to provide an opportunity for faculty to meet every day to strategize and problem solve as an entire staff. And still other districts have created site teams at each school composed of parents and teachers who jointly problem solve and make recommendations on the training needs of the staff.

Teachers in inclusive districts were also provided training in specific classroom strategies and instructional techniques to use with diverse learners. These training sessions included curricular adaptations and modifications, but primarily focused on a variety of instructional techniques, such as cooperative learning, peer coaching, and thematic instruction. In addition, administrators in inclusive schools and districts reported again and again the importance of providing training opportunities for teachers in behavior management.

The fourth category of training activities covers the change process in general. Although this training is less common, some principals arrange for inspirational speakers and experts on the change process to help staff understand and cope with the stress and anxiety connected with restructuring schools and working with diverse student populations. As one principal explained, "We have to care for the care givers; this [inclusion] is very demanding on the teachers."

Cognizant of the vital role of professional inservice development, the Project Lighthouse staff devoted particular attention to the professional development component of the project. The features that were incorporated into this program yielded a staff development program that was:

- Based on identified needs
- Flexible
- Practical
- Collaboratively developed
- Integrated

In the lighthouse schools, faculty and staff determined what kind of professional development

they needed and in what kind of format. Essentially, this was one of the functions of the building Inclusion Team and was based on the needs of that particular school, its staff and students. A formal needs assessment to attempt to identify the professional needs of the teachers and support staff is a good way to start. This needs assessment also identified the structure and format of activities preferred by faculty and staff.

Using the results of the needs assessment process as a foundation, the school-based team planned specific activities to address the identified needs. This plan was flexible, though, to target additional needs and opportunities that came up during the course of the year. Some examples of activities developed and implemented in the Lighthouse Schools included:

1. Mini workshops after school on selected topics;
2. Brown bag lunches of teachers sharing ideas;
3. Experts from the community as consultants;
4. Parents and university students providing release time;
5. Accessing information from the Internet;
6. A resource library of books and videos available for checkout;
7. Teachers mentoring one another;
8. Teachers and staff from other schools doing miniworkshops after school;
9. Site visits to other programs;
10. Viewing videotapes on inclusive practices.

Development activities were designed to assist teachers in developing specific skills that they could immediately use and implement in the classroom. Feedback collected from teachers indicated that this approach was very effective and resulted in improved teaching and student learning.

Professional Development for Science Instruction

The second project was a science project funded under the national Dwight D. Eisenhower Professional Development Act. The project was designed to provide:

- A deeper and more practical understanding of, and skill at, application of the scientific method in life-science problem solving;
- Hands-on application of methods to teach selected units of life-science;

- An increased knowledge of the cardiovascular, immune, and nervous systems, and cellular processes and their "hands-on" application to labs and in demonstrations.

The project's ultimate goal was to equip participating teachers with the knowledge and skills to help their students succeed in the sciences as demonstrated by their academic performance both in their current grade, as well as in subsequent grades. The project was structured around three major activities:

1) A summer institute for three weeks with four 4-hour sessions per week;
2) A 3-hour session every other Saturday during the academic year;
3) At least one site visit from the project facilitator during the academic year.

Data were collected for this Eisenhower project from a variety of sources. During the three week summer institute conducted on the ACU campus a number of topics were covered in different sessions by different presenters. Topics covered included:

- The Cardiovascular System
- The Immune System
- Cell Processes
- The Nervous System
- Using Rubrics
- Processing Skills

For each of these topics a pretest and posttest on the subject matter content was administered to the participants by the evaluator at the beginning and end of each session. The pre and posttests were developed by the evaluator from the notes and hand-outs utilized by the presenters. The differences in the mean scores pre and posttests were examined as a measure of the increase in participants' knowledge of that topic as a result of the session. Also, at the end of each session participants were asked to complete a questionnaire regarding their perceptions of the effectiveness of the session. This instrument dealt with the quality of the presentation, of instructional materials, session format, etc.

Approximately two weeks after the conclusion of the three-week summer institute structured interviews were held with participants. Two different sessions were held and participants were

invited to attend one of the sessions. Approximately half of the participants were involved in this activity. A series of questions were designed in advance that attempted to tap into the participants' knowledge of content covered in the workshop, and their perception of the effectiveness of how the content was delivered by the presenter. Questions were posed to elicit, not just facts about the content, but how content would be integrated in the participants' classrooms. Although there were specific questions developed for the structured interview, evaluators also asked follow-up questions based on participants' responses.

A month after the school year started in the fall selected teachers were observed in their classrooms to determine to what extent they were integrating the information and skills addressed in the summer institutes. Five teachers, or 25 percent of the participants, were observed. A modified rubric was used to collect this information.

Two final avenues were used to collect data. In February 1999, questionnaires were sent to teachers who had been institute participants and to their principals. The teachers' instrument was designed to determine the teachers' perception of how useful they felt the institute was over time and to determine how much, if any, of the information and skills addressed in the institute they were integrating into their teaching of science. The principals' instrument addressed principals' perceptions of any changes in the quality of the teachers' science teaching as a result of their participation in the summer institute.

The evaluation results indicated that the approaches used in this project to provide professional development were effective, but could be improved. Pre- and post-test results on content knowledge showed a great growth in teachers' knowledge. Gains ranged from 78 points (out of 100) on the Immune System to 20 points on Rubrics. The smallest gains in knowledge were in what might be called "pedogogical areas" (rubrics, processing skills), a reflection possibly of the fact that participants were already fairly familiar with the content in those areas.

The perceived effectiveness of the sessions were also quite high. The overall effectiveness of the workshop was rated as "highly effective" with the highest rating on the organization of the sessions and the lowest on the pace of the sessions.

In general, ratings on the individual sessions were high as well. However, criticisms were given

on the level of difficulty of the material with many teachers claiming it was too complex for them to adequately grasp and presented too quickly for them to absorb. There were also negative reactions to the format of the sessions. Teachers indicated a strong preference for activities that were more concrete and that involved their active participation. Teacher comments are provided in the Appendix.

Results collected later in the year indicated that some of the knowledge gained during the summer was retained throughout the insuing school year, however, not as much was retained as we would have hoped. We also found that teachers used some of the techniques and strategies they had learned in regard to teaching science classes, but they tended not to use those that did not fit in with their particular teaching style or preference. Also, the longer teachers waited to use techniques and strategies the less likely they were to use them at all. In fact, without a specific plan to incorporate skills used during the summer institute many teachers failed to make significant changes in the way they taught science.

The reactions to follow-up activities during the school were also mixed. Most teachers felt that the Saturday sessions and the in-class visits by the project director were useful, but, in general, those sessions did not translate into meaningful changes in the way the individual teachers taught science. Again, absent a specific plan and targeted follow-up, much of the efforts toward improving teachers' skills in teaching science were rendered ineffective. Perhaps one of the greatest benefits of the project was the report by principals that the teachers involved appeared to have renewed enthusiasm and interest in teaching science.

A Model for Effective Professional Development

Based upon our experiences with the two projects described above, we have developed the professional development model seen below in Figure One. This model attempts to facilitate the growth of teachers toward sustained skill mastery using a focused, programmed approach that provides support to the teacher at each stage. The model described in Figure One is currently being piloted in a project to design a more effective model for preparing and improving the quality of special education personnel. It is hoped that more information can be collected and analyzed regarding the model's efficacy in translating professional development activities into improved classroom learning.

Skill Acquisition Model for Professional Development
1. Basic Information Level This level will consist of a format to introduce participants to basic information and concepts. The purpose of this level will be for orientation and information dissemination to insure that participants have a grasp of the underlying research and the basic elements of the skill being addressed.
2. Observation Level Participants will be given the opportunity to observe skills and techniques being implemented successfully with students by teachers accomplished in the skill. This will take place in demonstration classrooms identified by Project staff.
3. Guided Practice Level This level will give participants experience in actual implementation of the skill or skills being addressed. This practice will be observed by a trained teacher or other professional who will provide feedback to the participant regarding his/her performance.
4. Skill Enhancement Level In this level participants will have an opportunity to again visit with the person who has observed them in implementing the skill, and view a videotape of their use of the skill in the Guided Practice Level. Participants will then be able to seek additional assistance and support before again engaging in Guided Practice.
5. Initial Mastery Level Once a participant feels comfortable in the Guided Practice Level, s/he will be teamed with a teacher or other professional trained in the skill. These two individuals will team teach until the participant has been evaluated by a third professional as having achieved mastery of the skill.
6. Sustained Mastery Level Every three months for the next year, the participant will be observed and evaluated by a teacher or other professional using a rubric designed for this purpose to insure that mastery is still present and to provide any additional assistance or support the teacher might need.

Figure One: A Professional Development Model for Teachers

The first step of this model could be accomplished in a workshop, by simply giving teachers books, articles and videotapes to study independently, or a combination of these since the purpose is to impart basic knowledge and information. It should contain some provision for teachers to be assessed regarding their mastery of basic content.

Teachers should be given the opportunity to observe an experienced teacher demonstrate the skill in an actual classroom in Step 2. This observation should be structured and provide for either written or verbal reflection on the part of the trainee. Next, in Step 3, the teacher being trained should be observed while demonstrating the skill him/herself. This observation should be done by a mentor, a teacher experienced in the targeted skill. It should also incorporate structured feedback for the trainee.

Visiting again with their mentor teacher in Step 4 will provide the trainee the opportunity to further refine the targeted skill and provide a greater level of proficiency with it. Step 5 allows the teacher to be paired with either the mentor teacher or another teacher experienced with the skill. Working side-by-side with another professional will assist the trainee in incorporating the targeted skill into the fabric of the actual classroom environment. Finally, in order to ensure that mastery is maintained over time, periodic reviews and feedback should be provided at regular intervals during the next year.

Conclusions

Lipka and Brinthaupt (1999) observed that one of the most rewarding and demanding journeys is living one's life as a teacher. As we begin our collective journey into a new century we must face those rewards and those demands together. The future of our world lies in our ability to teach our children to assume the mantle of leadership in the 21st Century. To do that we must have teachers who aspire to the highest levels of excellence, who possess the knowledge and the skills to take what we have learned in the previous century about teaching and learning and apply it to the schools of the new century.

If we are to accomplish that goal, we must do a more effective job of supporting our teachers through effective, relevant and useful professional development. It is our best hope to realize our potential and to embrace our future.

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APPENDIX

Teachers' comments on three-week summer seminar in teaching science to elementary students

-Some of the things discussed are way over 4th graders heads. The information needs to be geared way down so kids could understand better and I could teach the concepts better.

-More activities teaching us how to teach would have been great.

-I think too much was covered in too little time.

-A lot of the material is far too complex to teach in elementary school.

-Some of the activities, info. etc. was on a much higher education level that what we teach but much of this was too advanced.

-The information was good but it was too in depth. This material was too much to be taught at my particular grade level.

-There needs to be more activities based for immediate use in the classroom.

-If this class was related to my grade level. I can only use a few materials in my room.

-I wish we could have done more "lesson type" things for lower grade levels

-I feel that more time is needed on actually developing plans for the classroom use. Implementation plans need to be made. More grade level material is needed.

-The information presented was valuable. (if I were studying to be scientist); however as an elementary teacher the information was much too detailed and high level. -Material presented at times was fast paced. I needed more time to take in certain terms, especially those I had not heard since high school biology or my classes in college a long time ago.

-More hands on and sharing of lessons and materials to use in the classroom.

-Opportunities to try out some more of the ideas would have been helpful.

-More visuals, slower pace, information that is keyed lower towards the grade level that we are teaching. We felt that most of the information was over our heads and should have been modified for easy use in our classroom.

-I really enjoyed this institute, even thought it was hard for me to study for tests again after too many years. I will use the information in my classroom, and I look forward to utilizing the materials.

-More practical, hands-on activities for younger elementary school students.

-Lower the teaching level so that we can actually relay the info. to all grade levels. For example, put it in layman's terms so that we can teach it to K,1,2....